

# A Risk-Adjusted Evaluation Of The JSE Top 40 As An International Investment Option

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## ABSTRACT

*In response to the wealth destruction caused by the 2007/2008 global financial crisis, many developed economies have lowered their interest rates to improve their balance sheets (SARB, 2008-2012). However, in order for investors to sustain expected returns they will have to deviate from the traditional approach of investing in government bonds and consider investing in emerging markets, which are considered as potential drivers of global growth (Deloitte Consulting LLP, 2012). The goal of this paper is to establish the importance of considering South Africa as an emerging market investment opportunity, but also to acknowledge its ability of outperforming several other common emerging markets during the post-financial crisis period. This was done by means of a novel approach to the Omega ratio. The results from this paper confirms this, illustrating that the performance of the JSE Top 40 will compensate for the additional political risk that emerging market investments possess (Anshuman, 2010).*

**Keywords:** Emerging Markets; Omega Ratio; Risk-Adjusted Performance; JSE

## 1. INTRODUCTION

There is a large body of literature on the returns characteristics of emerging markets. Many academics points out that investing in emerging markets are beneficial in international portfolios because of their low correlation with the rest of the developed world (Claessens, Dasgupta & Glen, 1995; Rouwenhorst, 1999), and because emerging market returns seem to be influenced more by local rather than global information variables. This naturally serves as a good diversification for international portfolios. Various studies also points out that expected returns in emerging markets are higher than those in developed economies (Lesmond, 2005), and that these returns are more predictable than returns in the developed world (Harvey, 1995).

However, despite the possibility of earning higher returns, many also warn that emerging market investments expose investors to various risks. There seems to be widespread consensus on what these risks are. Bekaert and Harvey (1997) for example note that emerging markets have more predictable returns and higher volatility than developed markets. This theme is also repeated by De Santis and Imrohoroglu (1997) and Bekaert and Harvey (2002) to name but a few. However, as these economies become more open, their markets become less volatile (Bekaert & Harvey, 1997). It is this reduction in volatility, low correlation to the rest of the developed world, as well as the opportunity to share in the higher returns that made emerging markets a popular investment destination over the past two decades. Between 1991 and 2000 alone the total value of stocks traded increased from \$15 billion to \$200 billion, whilst market capitalization increased from \$306 billion to more than \$1.4 trillion (Lesmond, 2005).

African markets too have become popular amongst international investors of late. Many international investors view Africa as the final investment frontier. This continent houses not only an untapped market in terms of consumers, but investors too find value in Africa. In 1995 African stock exchanges gained about 40 per cent and by 2004 average returns on African stock exchanges were still doing well at 44 per cent (Alagidede & Panagiotidis,

2009). These returns have been spurred on by the trend amongst African countries to liberalise their markets while encouraging privatisation of government firms, implementing automated trading systems and launching educational programs to attract investors (Irving, 2005). It is also noteworthy that some of the bigger economies in Africa fall within the emerging markets paradigm. At the economic head of Africa sits South Africa, the biggest economy in Africa. South Africa also boasts the most liquid stock market and has the biggest market capitalisation in Africa (Smith & Dyakova, 2013).

South Africa, as many other developing economies, has been doing well on the back of the economic growth of the developed world in the past decade. However, as emerging economies became more integrated over the last 25 years, they became more susceptible to financial crises (Mendoza & Smith, 2013). The financial crisis of 2007/08 was no exception. This crisis, which initially manifested in the US real estate market (Kamin & DeMarco, 2012), led to the weakening of both consumer and investor confidence worldwide (SARB, 2008). With the weakened consumer demand and business sentiment, increased inflationary pressures tightened funding conditions in financial markets. This caused deterioration in global manufacturing activities that led to the fall of world economic growth and contributed to the greater risk associated with obtaining global financial stability (SARB, 2008). The consequences of the financial crisis also made insurable profitable investment decisions extremely difficult as market volatility tends to increase during crisis periods. This was again visible with the 2007/08 crisis leading to a re-coupling of developed and emerging markets (Mun & Brooks, 2013).

Nonetheless, during the post-2007/08 financial crisis there was a significant trend among investors to acquire financial assets in Emerging Market Economies (EMEs). As a result, the equity markets in the EMEs were able to outperform developed markets with gains of 61 per cent by the end of September 2009 (SARB, 2009). This increase in confidence in EME equities was partly due to the stimulus of their fiscal policy (SARB, 2009) and the lower interest rates in advanced economies (SARB, 2010). However, investors started to discard these equities again in 2011, and EMEs were adversely influenced because of uncertain US and European sovereign debt markets (SARB, 2011). This risk aversion against EMEs' equities continued in 2012, and investors' preference towards equities in advanced economies escalated (SARB, 2012). This was because the slowdown in advanced economies spilled over to the EMEs, with the fear that the slowdown in China's economic growth may hold significant financial and economic stability implications (SARB, 2012). However, optimism arose regarding the attractiveness for EME equities in 2013, when manufacturing and service-sector activities increased, along with greater confidence in China's seeming success in overcoming their economic growth slowdown (SARB, 2013).

Despite the fact that investment decisions during the late crisis and post-crisis periods were mainly based on the performance between advanced and emerging markets, as highlighted above, investors did not always recognise the ability of developing economies to provide secure investments due to the contagion effect from the US economy to the rest of the world. This is particularly true for the South African economy, where uncertainty surrounds its classification as a developing economy or a possible emerging market, which have been considered as one of the top performers among the large emerging equity markets (SARB, 2012). To this end, Table 1 compares the South African JSE All Share and JSE Top 40 indices with the most common advanced and emerging markets.

**Table 1:** Performance Comparison Between Markets – January 2010 To December 2013

Name	Minimum Returns	Maximum Returns	Average Returns	Cumulative returns	Standard Deviation	Risk-adjusted returns
Dow Jones	-5.546%	4.241%	0.051%	12.311%	0.027	1.859%
CAC 40	-5.479%	9.659%	0.019%	2.170%	0.046	0.407%
DAX	-5.819%	5.349%	0.055%	12.283%	0.051	1.067%
S&P 500	-6.663%	4.741%	0.056%	13.495%	0.029	1.915%
JSE Top 40	-3.763%	4.577%	0.057%	13.615%	0.028	2.001%
JSE All Share	-3.627%	4.324%	0.057%	13.828%	0.026	2.196%
Mexican IPC index	-5.810%	4.255%	0.033%	7.402%	0.028	1.179%
FTSE 100 index	-4.667%	5.161%	0.027%	5.665%	0.030	0.904%
S&P BSE Sensex	-4.125%	3.773%	0.025%	5.015%	0.039	0.645%
Nikkei 225 index	-10.554%	5.678%	0.054%	11.767%	0.053	1.011%
SC index <sup>&amp;</sup>	-5.299%	4.324%	-0.037%	-10.538%	0.039	-0.943%
RANKINGS PER CATEGORY FROM BEST TO WORST						
Minimum Returns	Maximum Returns	Average Returns	Cumulative Returns	Standard Deviation	Risk-adjusted returns	
JSE All Share	CAC 40	JSE Top 40	JSE All Share	JSE All Share	JSE All Share	
JSE Top 40	Nikkei 225 index	JSE All Share	JSE Top 40	Dow Jones	JSE Top 40	
S&P BSE Sensex	DAX	S&P 500	S&P 500	Mexican IPC index	S&P 500	
FTSE 100 index	FTSE 100 index	DAX	Dow Jones	JSE Top 40	Dow Jones	
SC index <sup>&amp;</sup>	S&P 500	Nikkei 225 index	DAX	S&P 500	Mexican IPC index	
CAC 40	JSE Top 40	Dow Jones	Nikkei 225 index	FTSE 100 index	DAX	
Dow Jones	JSE All Share	Mexican IPC index	Mexican IPC index	SC index <sup>&amp;</sup>	Nikkei 225 index	
Mexican IPC index	SC index <sup>&amp;</sup>	FTSE 100 index	FTSE 100 index	S&P BSE Sensex	FTSE 100 index	
DAX	Mexican IPC index	S&P BSE Sensex	S&P BSE Sensex	CAC 40	S&P BSE Sensex	
S&P 500	Dow Jones	CAC 40	CAC 40	DAX	CAC 40	
Nikkei 225 index	S&P BSE Sensex	SC index <sup>&amp;</sup>	SC index <sup>&amp;</sup>	Nikkei 225 index	SC index <sup>&amp;</sup>	

<sup>#</sup> Note that this table reports the annualised standard deviation to provide a more comprehensive risk perception.

\* Cumulative returns were estimated based on a 252 trading day horizon.

<sup>+</sup> Risk-adjusted returns were estimated by dividing the average returns with the annualised standard deviation.

& SC index = Shanghai Composite index

Source: Data were obtained from Yahoo Finance (2014) and McGregor (2014), respectively.

From Table 1 it is evident that both the JSE All Share and JSE Top 40 indices performed relatively well against the other markets. It displayed little fluctuations in terms of the minimum and maximum returns and the JSE All Share and the JSE Top 40 indices also ranked first and fourth with the lowest standard deviation, respectively, from a total of 11 markets. Furthermore, the JSE All Share and JSE Top 40 indices exhibited significant consistency in terms of average and cumulative returns, where it ranked under the top three markets, respectively (see Table 1). From these results the conclusion can be drawn that the JSE All Share and JSE Top 40 indices rank under the top three in terms of risk-adjusted returns, making it a suitable investment option to consider during the post-financial crisis period along with other investment options that advanced and emerging markets offer. Furthermore, due to the fact that equities are a preferred asset class to protect the purchasing power of investors in an environment of high inflation (Alagidede & Panagiotidis, 2010), it becomes imperative to evaluate the risk-adjusted performance of the South African equity market to justify its validity as an investment option. This leads to the purpose of this paper, which is twofold; to evaluate the more common South African index, namely the JSE Top 40, with the Omega ratio to highlight the significance of specific South African shares, and to do so by improving on the current form of the Omega ratio itself. The rest of this paper consists of an overview on performance measures and the methodology in Section 2, followed by a discussion of the data and the results in Sections 3 and 4, respectively. Section 5 will then conclude with the conclusion and recommendations.

## 2. PERFORMANCE MEASURES AND METHODOLOGY

Although the Sharpe ratio (1966) remains one of the most commonly used statistics in financial analysis (see for example Schuster and Auer, 2012; Auer and Schuhmacher, 2013) it also has some limitations. One of the biggest limitations of the Sharpe ratio is that it makes use of the standard deviation as a risk measure. Although the standard deviation proves sufficient in some instances it can easily be manipulated by seeking returns in “non-normal risks”, like extreme liquidity, credit risk and volatility variation risks (Amenc, Martellini & Sfeir, 2004:2). Another important limitation is that it does not differentiate between upside risk and downside risk, thus also penalising positive returns (De Wet, Krige & Smit, 2008). Thirdly, the Sharpe ratio operates independently of any fund benchmark in estimating excess returns, making the evaluation of some portfolios difficult (Amenc, Martellini & Sfeir, 2004). Fourthly, the Sharpe ratio also assumes that the returns of the individual security are uncorrelated with the mean portfolio returns; a process that might lead to misleading performance rankings in the process (Sharpe, 1994). Finally, the Sharpe ratio also operates on the assumption that returns are normally distributed. This is seldom the case, especially when working with emerging market returns (Hwang & Pedersen, 2004). This will limit the Sharpe ratio’s performance ranking abilities (Amin & Kat, 2003), especially when accounting for the increased divergence from normality occurring in the higher moments of the return distributions (Kat, 2003). Furthermore, different portfolio allocations will be possible with the presence of non-normal returns, when comparing the traditional mean-variance framework, developed by Markowitz (1952), to more advanced performance measures, like discussed below (see for example Fung & Hsieh, 1999a; Cvitanic, Lazrak, Martellini & Zapatero, 2003; Lamm, 2003; Terhaar, Staub & Singer, 2003; Popova, Morton & Popova, 2003; and Wong, Phoon & Lean, 2008).

Additionally, several approaches have been developed to overcome some of the Sharpe ratio’s weaknesses. The following ratios were for example developed as a substitute, which include the modified Sharpe ratio (Gregoriou & Gueyie, 2003); the modified Value at Risk (MVaR) model (Favre & Galeano, 2002); the Conditional Drawdown at Risk (CDaR) model; the Conditional Value at Risk (CVaR) model (Krokhmal, Palmquist & Uryasev, 2002); the Cornish-fisher ratio (Liang & Park, 2007); as well as the Polynomial Goal Programming process (PGP) used by Davies, Kat and Lu (2009). The paper by Salomons and Grootveld (2003) also made use of lower partial moment (LPM) models, by means of the Sortino ratio, to model emerging market returns. Another paper attempted to applied the Capital Asset Pricing Model (CAPM), but found that it was unable to capture the risk-return relationship of emerging market returns (Hwang & Pedersen, 2004). This failure was addressed by applying a LPM-CAPM, although it still failed to improve the results of the CAPM model (Hwang & Pedersen, 2004). Nonetheless, most of the above mentioned models suffer from the inability to capture all the risk-return characteristics in a return distribution. In order to overcome this shortcoming, this paper will apply an Omega ratio, as introduced by Keating and Shadwick (2002), to model emerging market returns. The Omega ratio, as a risk-adjusted performance ratio, still emphasise the importance of the risk of loss (Pedersen, Rudhulm-Alfvén, 2003), but treats upside and downside risk differently, thus “*heeding*” the criticism of the mean-variance portfolio optimisation of Markowitz (1952) (Gilli, Schumann, Di Tollo & Cabej, 2011:95). The Omega ratio also includes all the information that are encoded in all the moments (variance, mean, skewness, and kurtosis) without any prior assumptions (De Wet, Krige & Smit, 2008).

The Omega ratio is, therefore, beneficial as it considers both the upside potential (higher partial moments) and downside potential (lower partial moments) of an investment over the entire distribution. This differs from other ratios such as the Sharpe and Sortino ratios (see Sortino & Price, 1994), as well as the Calmar ratio (see Young, 1991), which only considers the lower partial moments (downside risk and maximum drawdown, respectively). The Omega ratio can, therefore, be formulated as follows (Eling & Schuhmacher, 2007):

$$\Omega(r) = \frac{\int_r^b (1-F(x))dx}{\int_a^r F(x)dx}, \quad (1)$$

where  $r$  denotes the selected threshold;  $x$  denotes the random one-period return of an investment;  $a$  and  $b$  denote the upper and lower bounds of the return distribution, respectively;  $\int_r^b (1-F(x))dx$  denotes the upside potential; and  $\int_a^r F(x)dx$  denotes the downside potential. Although the Omega ratio overcomes a great number of inefficiencies

that plague other performance measures, it is still fallible in that it is backward-looking. Also, it can discriminate between different underlying fund strategies and between different periods of various types of market activities (Botha, 2007).

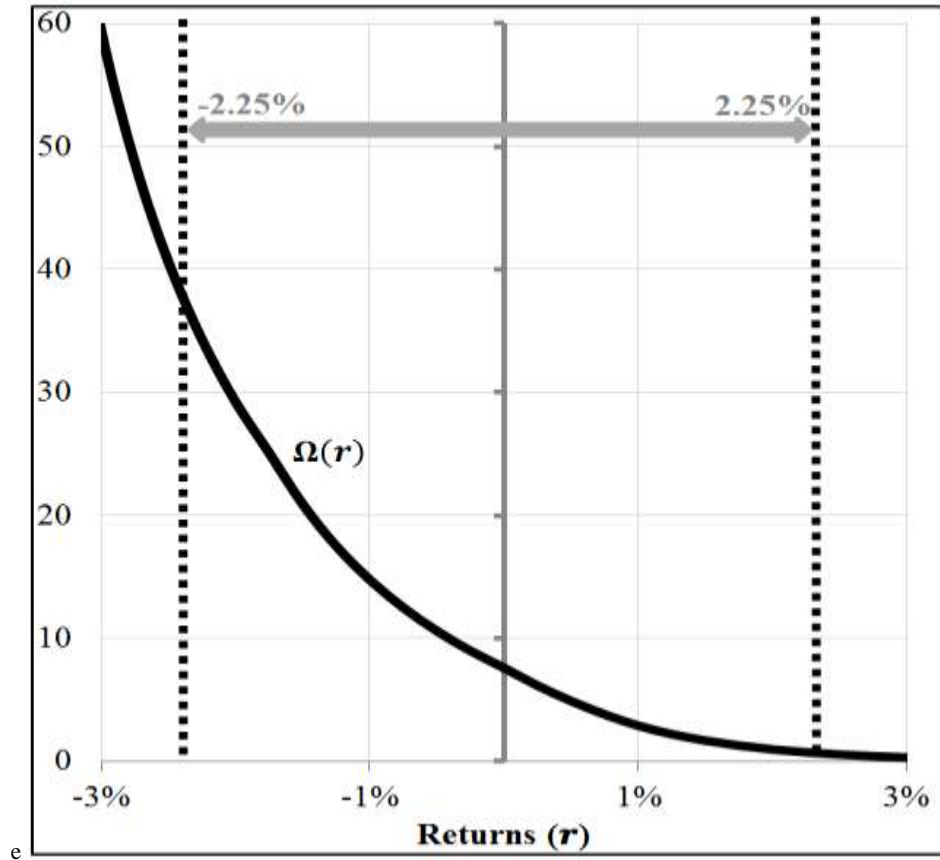
To ensure that the Omega ratio will provide desirable results it is important to apply a suitable threshold. As such, a risk-free rate is recommended by several studies; see for example Botha (2007), Eling and Schuhmacher (2007) and de Wet, Krige and Smit (2008). However, this approach has two weaknesses, which will lead to inconsistent performance rankings. Firstly, the threshold can change depending on an investor's performance preferences, which implies that different rankings will be possible for the same portfolio. Secondly, some investors consider minimising downside risk more important than maximising profit and *vice versa*, which can also lead to different Omega rankings. To overcome these weaknesses an alternative approach was implemented, which considers estimating the trend (slope) of the entire Omega function. This implies that two individual Ordinary-Least Squared (OLS) regressions were estimated, one for each side (positive & negative) of the distribution. A share will, therefore, be more desirable if it has a steep slope on the negative side ( $S_2$ ) of the distribution and a flat slope on the positive side ( $S_1$ ) of the distribution. This implies that the share with the smallest ratio ( $S_1 \div S_2$ ) will be more desirable in terms of performance. However, the two slopes must be estimated within an area of the distribution where the different Omega functions of each asset can still be distinguished, and before each function reaches infinity. After estimating the Omega function for each asset, this area was determined between -2.25 and +2.25, as illustrated in Figure 1.

### **3. DATA**

This paper employs the daily closing prices of the JSE Top 40 shares, which is based on the market capitalisation as on 30 July 2013, when this paper commenced (see Table 2). In order to substantiate the performance of the JSE Top 40 shares, this paper will also make use of the daily index values of the JSE All Share, the JSE Top 40 and several world indices (see Table 3). The data were obtained from the McGregor BFA (2014) database and from Yahoo Finance (2014), respectively, spanning from January 2010 to December 2013.

The choice of this time frame is to only capture the effects of the post-financial crisis on the performance of the JSE Top 40 shares. Due to a lack of data the Capital & Countries Properties Plc, the Rand Merchant Insurance Holdings Limited, the NBKIOEXXSTUB10, the NBNPNR268.50CII and the Life Healthcare Group Holdings Limited share prices were excluded from the list of JSE Top 40 shares under investigation.

**Figure 1: Omega As A Function Of Returns – Introducing A New Threshold Approach**



Source: Compiled by authors.



**Table 2:** The JSE Top 40 Shares – According To Highest Market Capitalisation At 30 July 2013

<b>Ticker</b>	<b>Name</b>	<b>Sector</b>	<b>Industry</b>	<b>Sub-industry</b>	<b>Market Capitalisation (Rand)</b>
BTI	British American Tobacco Plc	Consumer staples	Consumer products	Tobacco	1 055 781 382 590
SAB	SABMiller Plc	Consumer staples	Consumer products	Beverages	787 559 096 007
BIL	BHP Billiton Plc	Materials	Iron & steel	Steel raw material suppliers	610 051 841 953
CFR	Compagnie Financière Richemont	Consumer discretionary	Apparel & textile products	Apparel, footwear, accessories	484 624 800 000
NPN	Naspers Limited	Communications	Media	Local media	333 904 872 477
MTN	MTN Group Limited	Communications	Telecom	Telecom carriers	331 595 120 510
AGL	Anglo American Plc	Materials	Metals & mining	Base metals	302 441 463 754
SOL	Sasol Limited	Energy	Oil, gas & coal	Integrated oils	292 478 522 259
SBK	Standard Bank Group Limited	Financials	Banking	Banks	177 165 273 588
VOD	Vodacom Group Limited	Communications	Telecom	Telecom carriers	173 063 929 740
FSR	FirstRand Limited	Financials	Banking	Banks	164 909 794 403
OML	Old Mutual Plc	Financials	Insurance	Life insurance	141 504 708 341
KIO	Kumba Iron Ore Limited	Materials	Iron & steel	Steel raw material suppliers	141 292 675 074
SLM	Sanlam Limited	Financials	Insurance	Life insurance	98 553 000 000
APN	Aspen Pharmacare Holdings	Health care	Biotech & pharmaceuticals	Generic Pharmaceuticals	97 209 082 840
AMS	Anglo American Platinum Corporation Limited	Materials	Metals & mining	Precious metal mining	94 118 978 214
SHP	Shoprite Holdings Limited	Consumer staples	Retail staples	Food retailers	93 460 915 548
NED	Nedbank Group Limited	Financials	Banking	Banks	90 265 358 378
REM	Remgro Limited	Consumer staples	Consumer products	Food manufacturing	88 975 812 067
BVT	The Bidvest Group Limited	Consumer staples	Distribute/Wholesale consumer staples	Food product wholesalers	79 147 985 353
IMP	Impala Platinum Holdings Limited	Materials	Metals & mining	Precious metal mining	63 221 427 600
TBS	Tiger Brands Limited	Consumer staples	Consumer products	Food manufacturing	59 660 806 282
RMH	RMB Holdings Limited	Financials	Speciality finance	Other financial services	56 355 192 462
MDC	Mediclinic International	Health care	Health care facilities/services	Health care services	56 224 828 526
WHL	Woolworths Holdings Limited	Consumer staples	Retail staples	Food retailers	55 403 811 768
EXX	Exxaro Resources Limited	Energy	Oil, gas & coal	Coal operations	55 223 779 647
DSY	Discovery Limited	Financials	Insurance	Life insurance	53 002 172 524
ANG	AngloGold Ashanti Limited	Materials	Metals & mining	Precious metal mining	51 077 414 689
MNP	Mondi Plc	Materials	Containers & packaging	Containers & packaging manufacturing	50 873 868 716

(Table 2 continued)

ITU	Intu Properties Plc	Financials	Real estate investment trust	Retail real estate investment trust	48 543 131 731
SHF	Steinhoff International Holdings Limited	Consumer discretionary	Home & office products	Home & office furnishings	48 290 855 354
GRT	Growthpoint Properties Limited	Financials	Real estate operations & services	Office owners & developers	47 421 367 282
ASR	Assore Limited	Materials	Iron & steel	Steel raw material suppliers	47 117 362 500
GFI	Gold Fields Limited	Materials	Metals & mining	Precious metal mining	43 884 903 263
IPL	Imperial HoldingS Limited	Consumer discretionary	Retail discretionary	Auto retail stores	42 810 911 575
INP	Investec Plc	Financials	Banking	Banks	40 278 615 070
TRU	Truworths International Limited	Consumer discretionary	Retail discretionary	Speciality apparel stores	38 022 881 791
REI	Reinet Investments S.C.A.	Financials	Speciality finance	Other financial services	37 130 873 697
MSM	Massmart Holdings Limited	Consumer staples	Retail staples	Mass merchants	36 026 355 232
ARI	African Rainbow Minerals	Materials	Iron & steel	Steel raw material suppliers	35 707 495 363

Source: Compiled by authors and the fundamental information were collected from the Bloomberg (2014) database.

**Table 3:** List of indices under investigation

Name	Origin	Classification
Dow Jones	North America	Advanced market
S&P 500	North America	Advanced market
CAC 40	France	Advanced market
DAX	Germany	Advanced market
FTSE 100	United Kingdom	Advanced market
S&P BSE Sensex	India	Emerging market
SC index	China	Emerging market
Nikkei 225 index	Japan	Advanced market
Mexican IPC index	South America (Latin America)	Emerging market
JSE All Share index	South Africa	Emerging market
JSE Top 40 index	South Africa	Emerging market

Source: Compiled by authors.

#### 4. RESULTS

The first step of the empirical study is to establish the descriptive statistics of the time series under investigation. The results reported in Table 4 exhibits a clear indication that all the JSE Top 40 shares and indices are leptokurtic, with a kurtosis greater than three. These findings emphasise the results found by Fung and Hsieh (1999b), who argued that return series are known to be leptokurtic. Also, half of the JSE Top 40 shares exhibits a negative skewness, whereas all the indices except the CAC 40 and the S&P BSE Sensex Bombay Index illustrate a negative skewness. This implies that investors which invest in these shares or markets may be exposed to a downside surprise (see for example McFall Lamm, 2003). Furthermore, it can be argued that variance, standard deviation and beta will not be able to provide a perception of the actual risk involved, where these measures will only demonstrate how the positive returns will be penalised (Kat, 2003).



Table 4: Descriptive Statistics Of The JSE Top 40 Shares And World Indices

Name	Mean	Median	Max.	Min.	Skewness	Kurtosis	Jarque-Bera	Anderson-Darling	Shapiro-Wilk
AGL	0.000	0.000	0.078	-0.058	0.242	3.673	28.686	0.820	0.994
AMS	0.000	-0.001	0.083	-0.077	0.274	4.015	55.418	2.229	0.990
ANG	-0.001	-0.001	0.119	-0.077	0.515	6.266	488.589	5.319	0.965
APN	0.001	0.001	0.081	-0.057	0.306	4.683	133.596	4.440	0.981
ARI	0.000	0.000	0.088	-0.072	0.184	4.006	47.841	2.146	0.991
ASR	0.001	0.000	0.202	-0.085	0.814	10.599	2516.745	14.617	0.935
BIL	0.000	0.000	0.062	-0.052	0.191	3.661	24.330	1.025	0.994
BTI	0.001	0.001	0.044	-0.043	-0.113	3.905	36.266	1.252	0.993
BVT	0.001	0.000	0.071	-0.052	0.180	4.818	143.184	4.638	0.979
CFR	0.002	0.001	0.081	-0.072	0.092	4.814	138.573	4.690	0.980
DSY	0.001	0.001	0.066	-0.091	-0.345	7.480	856.047	6.679	0.961
EXX	0.001	0.001	0.065	-0.071	-0.077	3.387	7.223	1.482	0.996
FSR	0.001	0.001	0.059	-0.106	-0.291	5.015	183.258	0.978	0.987
GFI	-0.001	-0.001	0.134	-0.135	0.154	6.889	634.307	4.499	0.966
GRT	0.001	0.000	0.068	-0.055	-0.066	6.074	394.496	9.810	0.960
IMP	0.000	0.000	0.092	-0.062	0.231	3.688	28.557	1.832	0.992
INP	0.001	0.001	0.085	-0.073	-0.075	4.753	128.925	2.721	0.985
IPL	0.001	0.000	0.067	-0.054	0.170	3.520	16.090	1.497	0.995
ITU	0.000	0.000	0.079	-0.206	-2.224	34.647	42554.090	9.760	0.880
KIO	0.001	0.000	0.078	-0.076	-0.008	4.357	76.788	4.491	0.983
MDC	0.001	0.000	0.069	-0.071	0.006	6.155	414.847	8.460	0.963
MNP	0.002	0.002	0.075	-0.082	0.118	4.735	127.750	4.259	0.982
MSM	0.000	0.000	0.106	-0.080	0.274	6.811	617.535	4.329	0.970
MTN	0.001	0.001	0.082	-0.074	-0.017	3.902	33.947	0.744*	0.994
NED	0.001	0.001	0.060	-0.061	0.052	4.226	63.091	1.336	0.990
NPN	0.001	0.002	0.082	-0.065	-0.044	4.043	45.623	3.297	0.989
OML	0.001	0.001	0.117	-0.159	-0.606	16.417	7561.785	5.791	0.923
REI	0.001	0.000	0.050	-0.034	0.123	4.000	44.197	2.960	0.990
REM	0.001	0.001	0.064	-0.045	0.147	4.283	72.188	2.223	0.988
RMH	0.001	0.001	0.071	-0.305	-3.920	65.499	165317.900	8.769	0.832
SAB	0.001	0.002	0.058	-0.067	-0.131	4.502	96.875	2.445	0.988
SBK	0.000	0.000	0.051	-0.063	-0.118	4.171	59.457	1.543	0.990
SHF	0.001	0.000	0.053	-0.053	0.124	3.451	11.036	1.674	0.995
SHP	0.001	0.001	0.058	-0.059	-0.059	3.611	16.155	0.684*	0.996
SLM	0.001	0.001	0.057	-0.051	-0.012	4.559	101.236	5.670	0.980
SOL	0.001	0.001	0.056	-0.045	0.029	3.538	12.217	0.939	0.996
TBS	0.001	0.001	0.059	-0.061	-0.145	3.760	27.529	1.064	0.995

(Table 4 continued)

<b>TRU</b>	0.001	0.001	0.065	-0.081	-0.329	4.236	81.702	1.587	0.988
<b>VOD</b>	0.001	0.001	0.056	-0.084	-0.141	4.976	165.957	2.344	0.984
<b>WHL</b>	0.002	0.001	0.086	-0.058	-0.013	4.064	47.221	1.702	0.991
<b>JSE Top 40</b>	0.001	0.001	0.046	-0.038	-0.104	4.214	63.166	3.450	0.986
<b>JSE All Shares</b>	0.001	0.001	0.043	-0.036	-0.155	4.281	72.349	3.478	0.986
<b>Dow Jones</b>	0.001	0.001	0.042	-0.055	-0.351	6.800	625.976	13.184	0.947
<b>CAC 40</b>	0.000	0.000	0.097	-0.055	0.150	6.643	571.180	7.581	0.962
<b>DAX</b>	0.001	0.001	0.053	-0.058	-0.089	5.600	290.509	11.059	0.961
<b>S&amp;P 500</b>	0.001	0.001	0.047	-0.067	-0.373	7.140	741.766	13.906	0.944
<b>Mexican IPC index</b>	0.000	0.000	0.043	-0.058	-0.356	5.747	337.814	5.909	0.972
<b>FTSE 100 index</b>	0.000	0.000	0.052	-0.047	-0.108	5.127	192.099	6.223	0.975
<b>S&amp;P BSE Sensex Bombay</b>	0.000	0.000	0.038	-0.041	0.042	3.681	19.432	1.873	0.994
<b>Nikkei 225 index</b>	0.001	0.001	0.057	-0.106	-0.720	7.751	1011.779	2.695	0.962
<b>SC index</b>	0.000	0.000	0.043	-0.053	-0.223	4.798	141.540	6.094	0.977

\* Implies that the null hypothesis for a normal distribution is rejected at a 10% confidence interval.

To further emphasise these arguments, three normality tests are reported in order to justify the presence of non-normality. The first normality test entails the Jarque-Bera test (Jarque & Bera, 1987), which is dependent on higher moments (skewness & kurtosis) to differentiate between types of distributions. Although, the skewness and kurtosis coefficient have several disadvantages that have to be acknowledged with the evaluation of the return distribution characteristics. Firstly, both have an unbounded influence function and both have zero breakdown value, which imply that bias estimates could be generated with the presence of outliers. Secondly, both are only defined on distributions that have finite moments (Brys, Hubert & Struyf, 2008). Nonetheless, evidence has been found which illustrated that the Jarque-Bera test gives the most powerful results for normal distributions (Öztuna, Elhan & Tüccar, 2006). To provide more convincing results however, two additional normality tests will be implemented which are based on two different foundations. This includes the test introduced by Anderson and Darling (1952), which is based on an empirical distribution function, where its applicability has also been justified by several studies, including Thadewald and Büning (2007) as well as Balakrishnan, Chimitova, Galanova and Vedernikova (2013).

The third normality test is that of Shapiro & Wilk (1965), which is based on correlation. The superiority of the Shapiro-Wilk test over the Anderson-Darling and the Jarque-Bera test has been confirmed by Bradley and Morris (2013). However, Yap and Sim (2011) found that the Jarque-Bera test will illustrate similar performance with symmetric long-tailed distributions, whereas the Anderson-Darling and the Shapiro-Wilk tests tend to be more powerful normality tests with the presence of asymmetric distributions.

The presence of a normal distribution is rejected at a five per cent confidence interval for all the JSE Top 40 shares and for all the indices, except for Shoprite Holdings Limited (SHP) and for MTN Group Limited (MTN), which rejected the null hypothesis of normality at a ten per cent confidence interval. These findings accentuate the inability of traditional risk-adjusted performance measures, (which make use of variance, standard deviation or beta to generate a reliable performance ranking; see for example Bernardo & Ledoit, 2000; Lamm, 2003) to rank investment portfolios. This justifies the importance of using the Omega ratio instead.

In addition, the second step of the empirical study is to evaluate the risk-adjusted performance of the JSE Top 40 shares by means of the Omega ratio. From the results obtained from the Omega ratio, as reported in Table 5, it is further substantiated that there are South African investment options that have the

ability to outperform most common world indices. Note that only the top 20 rankings will be discussed, whereas the complete Omega rankings are available in Table A in the appendix. The results reported that the metals and mining industry (1<sup>st</sup> & 3<sup>rd</sup> place) and the iron and steel industry (2<sup>nd</sup> place) were overall the three best performing sectors, respectively, over the period under investigation. Individually, it was Impala Platinum Holding Limited (IMP), Assore Limited (ASR) and Anglo American Platinum Corporation Limited (AMS) that were the top three performing shares. It is interesting to note that there was no correlation between the Omega rankings, the actual Top 40 rankings (based on market capitalisation), the average closing price, the average trading volume or the average Price-to-Earnings (P/E) ratio. Though, from the 16 shares that were able to outperform all the world indices, (with the CAC 40 ranking the highest) only eight shares exhibited an average P/E ratio lower than that of the JSE All Share index (15.441) and of the JSE Top 40 index (15.789). These findings, therefore, suggest that there are seven shares which are undervalued and should be considered as more promising investment options compared to the other shares, whereas Intu Properties Plc (ITU) exhibited a negative average P/E ratio and will be excluded from further discussions. These seven shares include Exxaro Resources Limited (EXX), Kumba Iron Ore Limited (KIO), BHP Billiton Plc. (BIL), Assore Limited (ASR), FirstRand Limited (FSR), Standard Bank Group (SBK) and Investec Plc (INP), respectively. Furthermore, Remgro Limited (REM), Discovery Limited (DSY) and Tiger Brands Limited (TBS) were the three poorest performing shares over the period under investigation (see Table A in the appendix), respectively, making consumer products and insurance the less desirable South African industries.

**Table 5: Top 20 Performance Ranking Based On The Omega Ratio – Ranked From Best To Worst**

Ticker	Name	Industry	Market Capitalisation (Rand)	JSE Top 40 Market Cap ranking	Ave. Price (in cent)	Ave. Volume	Ave. P/E
IMP	Impala Platinum Holdings Limited	Metals & mining	63 221 427 600	22	16365.668	2279765.126	29.220
ASR	Assore Limited	Iron & steel	47117362500.00	34	25637.893	74558.390	12.609
AMS	Anglo American Platinum Corporation Limited	Metals & mining	94118978214.00	17	54744.475	367652.765	42.915
ARI	African Rainbow Minerals	Iron & steel	35 707 495 363	1	18297.654	443369.964	21.139
MNP	Mondi Plc	Containers & packaging	50 873 868 716	30	8189.448	910740.367	24.034
ITU	Intu Properties Plc	Real estate investment trust	48 543 131 731	31	4503.445	1113958.112	-8.935
EXX	Exxaro Resources Limited	Oil, gas & coal	55 223 779 647	27	15667.477	978295.021	11.462
INP	Investec Plc	Banking	40 278 615 070	37	5554.914	1574844.578	13.748
AGL	Anglo American Plc	Metals & mining	302441463754.00	8	28478.241	3943631.195	19.797
KIO	Kumba Iron Ore Limited	Iron & steel	141 292 675 074	14	46057.598	483641.348	11.679
RMH	RMB Holdings Limited	Speciality finance	56 355 192 462	24	3481.790	2050052.888	2369.179
NPN	Naspers Limited	Media	333 904 872 477	6	47900.352	1687722.747	38.109
TRU	Truworths International Limited	Retail discretionary	38 022 881 791	38	7745.994	1637317.629	16.684
SBK	Standard Bank Group Limited	Banking	177 165 273 588	10	10838.166	4066060.335	12.757
FSR	FirstRand Limited	Banking	164 909 794 403	12	2434.614	12716436.582	12.663
APN	Aspen Pharmacare Holdings	Biotech & pharmaceuticals	97209082840.00	16	12937.751	1207954.462	22.184
BIL	BHP Billiton Plc	Iron & steel	610051841953.00	4	25775.196	3309468.520	12.001
<b>CAC 40</b>							
CFR	Compagnie Financière Richemont	Apparel & textile products	484 624 800 000	5	5263.588	9046622.864	22.361
SAB	SABMiller Plc	Consumer products	787 559 096 007	3	32474.891	1668051.606	25.137

\*Note: This table only reports the top 20 rankings, whereas the complete Omega ratio ranking is available in the Appendix.

Source: The Fundamental data for the JSE shares and indices were also collected from the McGregor BFA (2014) database.

Moreover, from a world index perspective it was the CAC 40 and the Shanghai Composite index who performed the best, whereas the S&P BSE Sensex index and the Mexican IPC index illustrated the poorest risk-adjusted performance (see Table A in the appendix). Although, the JSE All Share index failed to perform well relative to the other world indices (3<sup>rd</sup> poorest), the risk-adjusted performance of several individual JSE Top 40 shares emphasised the possibility that South Africa, as a developing market, may have the ability to contribute more to an international investment portfolio compared to some advanced and emerging markets. This proves that the South African equity market exhibited more of the performance characteristics of an emerging market compared to the general expectations of the ability of a developing market.

## 5. CONCLUSION

Investing in emerging markets is considered to be beneficial to international portfolios, as it provides a lower correlation with the rest of the developed world and higher expected returns compared to other markets. These features were especially beneficial to investors during the post-crisis period, where there was a significant increase in the demand for financial assets in emerging markets. However, it was not long until the effects of the financial crisis spilled over to these emerging markets, causing doubt and encouraging investors to return to investing in developed markets. This paper however proves that the South African equity market, more specifically the JSE Top 40 shares, have more promise to an international investor compared to what most common world indices have to offer. The findings illustrate that there were 16 JSE Top 40 shares that were able to outperform most common world indices, with Impala Platinum Holding Limited (IMP), Assore Limited (ASR) and Anglo American Platinum Corporation Limited (AMS) being the top performing shares, respectively. It was also interesting to note from these 16 shares it was only seven shares who reported a lower average P/E ratio compared to the JSE All Share index and the JSE Top 40 index. These shares include Exxaro Resources Limited (EXX), Kumba Iron Ore Limited (KIO), BHP Billiton Plc. (BIL), Assore Limited (ASR), FirstRand Limited (FSR), Standard Bank Group (SBK) and Investec Plc (INP), respectively.

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## 7. APPENDIX

**Table A:** Complete Omega Ranking - Ranked From Best To Worst

<b>Omega Ranking</b>	<b>Ticker</b>	<b>Name</b>	<b>Industry</b>	<b>Market Capitalisation (Rand)</b>	<b>JSE Top 40 Market Cap Ranking</b>
1	IMP	Impala Platinum Holdings Limited	Metals & mining	63 221 427 600	22
2	ASR	Assore Limited	Iron & steel	47117362500.00	34
3	AMS	Anglo American Platinum Corporation Limited	Metals & mining	94118978214.00	17
4	ARI	African Rainbow Minerals	Iron & steel	35 707 495 363	1
5	MNP	Mondi Plc	Containers & packaging	50 873 868 716	30
6	ITU	Intu Properties Plc	Real estate investment trust	48 543 131 731	31
7	EXX	Exxaro Resources Limited	Oil, gas & coal	55 223 779 647	27
8	INP	Investec Plc	Banking	40 278 615 070	37
9	AGL	Anglo American Plc	Metals & mining	302441463754.00	8
10	KIO	Kumba Iron Ore Limited	Iron & steel	141 292 675 074	14
11	RMH	RMB Holdings Limited	Speciality finance	56 355 192 462	24
12	NPN	Naspers Limited	Media	333 904 872 477	6
13	TRU	Truworths International Limited	Retail discretionary	38 022 881 791	38
14	SBK	Standard Bank Group Limited	Banking	177 165 273 588	10
15	FSR	Firststrand Limited	Banking	164 909 794 403	12
16	APN	Aspen Pharmacare Holdings	Biotech & pharmaceuticals	97209082840.00	16
17	BIL	BHP Billiton Plc	Iron & steel	610051841953.00	4
<b>18</b>	<b>CAC 40</b>				
19	CFR	Compagnie Financière Richemont	Apparel & textile products	484 624 800 000	5
20	SAB	SABMiller Plc	Consumer products	787 559 096 007	3
21	OML	Old Mutual Plc	Insurance	141 504 708 341	13
22	MSM	Massmart Holdings Limited	Retail staples	36 026 355 232	40
23	WHL	Woolworths Holdings Limited	Retail staples	55 403 811 768	26
24	GFI	Gold Fields Limited	Metals & mining	43 884 903 263	35
25	MTN	MTN Group Limited	Telecom	331 595 120 510	7
26	NED	Nedbank Group Limited	Banking	90 265 358 378	19
27	MDC	Mediclinic International	Health care facilities/services	56 224 828 526	25
28	IPL	Imperial HoldingS Limited	Retail discretionary	42 810 911 575	36

(Table A continued)					
<b>29</b>	<b>Shanghai Composite index</b>				
30	SHF	Steinhoff International Holdings Limited	Home & office products	48 290 855 354	32
31	ANG	AngloGold Ashanti Limited	Metals & mining	51077414689.00	29
32	SLM	Sanlam Limited	Insurance	98 553 000 000	15
<b>33</b>	<b>S&amp;P 500</b>				
34	BVT	The Bidvest Group Limited	Distribute/Wholesale consumer staples	79147985353.00	21
35	VOD	Vodacom Group Limited	Telecom	173 063 929 740	11
<b>36</b>	<b>Nikkei 225 index</b>				
37	SHP	Shoprite Holdings Limited	Retail staples	93 460 915 548	18
<b>38</b>	<b>JSE Top 40 index</b>				
39	SOL	Sasol Limited	Oil, gas & coal	292 478 522 259	9
<b>40</b>	<b>DAX</b>				
<b>41</b>	<b>Dow Jones</b>				
42	BTI	British American Tobacco Plc	Consumer products	1055781382590.00	2
<b>43</b>	<b>FTSE 100 index</b>				
<b>44</b>	<b>JSE All Share index</b>				
45	GRT	Growthpoint Properties Limited	Real estate operations & services	47 421 367 282	33
<b>46</b>	<b>Mexican IPC index</b>				
<b>47</b>	<b>S&amp;P BSE Sensex</b>				
48	REI	Reinet Investments S.C.A.	Speciality finance	37 130 873 697	39
49	TBS	Tiger Brands Limited	Consumer products	59 660 806 282	23
50	DSY	Discovery Limited	Insurance	53 002 172 524	28
51	REM	Remgro Limited	Consumer products	88 975 812 067	20